

Newman and Swift Reply: We agree with the authors of the previous Comment [1] that the percolative effect which occurs at $\alpha = -1$ (for $d > 1$) offers a very useful insight into the behavior of the Kardar-Parisi-Zhang (KPZ) interface as one tunes the shape of the noise distribution. We also agree that, given that the height distribution in their Fig. 1 (for $d = 2$ and $\alpha = -1/2$) has yet to reach an asymptotic form, there indeed appear to be long crossover times in the system for low values of α . As we stressed in our original Letter [2], the numerical data we obtained are “strongly suggestive” of nonuniversal behavior, but further numerical work would be required to clarify the role of temporal crossover. In [2] we tested for corrections to scaling (CTS) in the interface width $W(t)$, but found them to be small, namely, the CTS exponent has roughly half the value of the width exponent β . From Fig. 1 of Ref. [1], one can see that the height distribution P is more sensitive to CTS than is $W(t)$, which is the second moment of P .

It is certainly interesting that the interface width should be relatively insensitive to CTS, while the height distribution is still crossing over to its asymptotic form. Whether one can infer from this that β is very slowly crossing over from a measured value of ≈ 0.13 to the “expected” value of ≈ 0.24 is not entirely clear. Although one can obtain very good data collapse for the height distribution when the noise is Gaussian, the failure of such a collapse for low values of α may also be indicative of more complicated scaling (see point 2 below). Furthermore, it seems unlikely to us that the percolative effect has any bearing on the KPZ physics for $\alpha \geq 0$. Our numerical data show that the exponents are very sensitive to the noise distribution for both positive and negative values of α . Given the difficulties of proving universality from numerical simulation, it is worthwhile to consider the following two facts.

(1) It is known [3] that spatially discretized forms of the KPZ equation are generally unstable (for large coupling) and therefore lie outside the putative KPZ universality class. Such sensitivity to microscopic details is not a property one normally associates with universality.

(2) It can be shown [4,5] that the deterministic version of this problem, often referred to as the Burgers equation with random initial data, is sensitive to the shape of the distribution of initial conditions. If one defines the initial distribution of the height (which corresponds to the velocity potential in the Burgers equation) to be parameterized by α , just as in the present discussion of the noise distribution [see Eq. (2) of Ref. [1]], one finds that the dynamic length scale $L(t)$ increases in time with an exponent equal to $(1 + \alpha)/(d + 2 + 2\alpha)$. For a Gaussian initial distribution, $L(t) \sim t^{1/2}$ up to logarithmic corrections. Not only does this system have nonuniversal exponents, but it has also been shown [5] that naive scaling breaks down due to the existence of *two*

important dynamic length scales [corresponding to $L(t)$ and a diffusive length scale $l_D \sim t^{1/2}$].

As a final point, it may be useful to explore new properties of the KPZ equation in order to gain much needed insight into scaling and the existence or otherwise of universality. Prime candidates for a numerical investigation are persistence probabilities [6] and the distribution of sign times [7]. The former has recently been studied for the $d = 1$ KPZ equation [8], with interesting effects noted as the shape of the noise distribution is changed. The latter is currently under investigation for a wider range of interface models [9].

Ultimately, the question of the existence of universality in KPZ physics can only be convincingly answered from a renormalization group (RG) analysis. As is well appreciated, given the strong coupling properties of the KPZ equation, such an analysis is beyond our present expertise. However, a recent RG calculation [10] suggests that the strong coupling regime may be more intricate than was otherwise imagined. In our opinion, a clear understanding of the KPZ equation remains a challenge for the future.

T.J. Newman
Department of Physics
Virginia Tech
Blacksburg, Virginia 24061

M.R. Swift
Department of Physics and Astronomy
University of Manchester
Manchester M13 9PL, United Kingdom

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